

# Have birds shifted their range limits southwards in Côte d'Ivoire, West Africa?

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Les changements du climat (réchauffement planétaire) ont provoqué, sous les latitudes nordiques, des changements notables dans la phénologie et la distribution de certaines populations d'oiseaux. Bien que sous les tropiques les changements potentiels n'aient pas encore été étudiés, il est probable que des populations soient touchées par la modification de l'habitat due aux changements du climat et aux activités humaines. L'article présente des données qui indiquent qu'un nombre significativement plus grand d'espèces d'oiseaux en Côte d'Ivoire pourrait avoir étendu son aire de distribution vers le sud (plutôt que vers le nord) pendant les 15 dernières années, et ces résultats sont examinés dans le contexte des changements du climat et de l'habitat local.

## Introduction

Global temperatures rose during the 20th century and further warming is predicted for the current century as a result of human activities. This will eventually cause alterations to the Earth's habitats and shifts in climatic and vegetational zones, both in altitude and latitude<sup>16</sup>. Plant and animal species that are adjusted to certain climates and habitats are thought to react to such changes by adjusting their range to the changing environmental gradients and/or their behaviour accordingly. Many reactions reported from northern temperate regions during the last decade have been directly related to climate change. Examples include increased plant growth at northern latitudes<sup>14</sup>, faunal changes in rocky intertidal pools<sup>3</sup>, poleward shifts of North American<sup>15</sup> and European butterflies<sup>16</sup>, changes in egg-laying trends<sup>1,5,6</sup>,

and timing of migration<sup>1,23,24</sup> and northward range extensions in European birds<sup>28</sup>. However, climatic change is likely to have global effects. One of these, compounded by regional mismanagement including forest clearance or overgrazing by livestock, is the desertification of vast areas in the tropics. This may not solely affect desert fringes but could produce a general shift in vegetation zones, eg of different savanna types.

Here we present data indicating that a greater number of bird species in Côte d'Ivoire, West Africa, have been observed further south of their range limits, as known in 1985, than further north during the past 15 years. We do not present conclusive evidence of range extensions for these species but discuss the possibility that they have occurred due to global warming or habitat alteration. In so doing we seek to demonstrate the need for more sophisticated research in this field (aside from random anecdotal observations) to reveal range shifts or range extensions of tropical species, along with studies of the general effects of global warming on tropical communities.

## Methods

We analysed observations of latitudinal shifts in range limits of bird species in Côte d'Ivoire, West Africa (05°–11°N). The geographic range of all species recorded in the country was summarised in 1985<sup>25</sup>. The publication was based on observations throughout the country made in 1967–1984, but, as older records were classified 'historical', it represents real knowledge of the ranges of birds in 1984 within Côte d'Ivoire (Thiollay pers comm). Since 1985 a number of published observations from different localities have reported north or south range extensions for several species in the country<sup>2,8,9,12,20–22,26,29</sup>.



African Broadbill *Smithornis capensis*  
by Mark Andrews

Additionally, we have utilised a number of personal unpublished observations.

We assumed that observations were random without observer preference for northern or southern areas (though this may not be true). We traced observations from localities in coastal areas (04°40'N–05°20'N), Lamto (06°13'N), Yapo (05°42'N), Comoé National Park (08°40'N–09°35'N) and Leraba (10°06'N), which are distributed throughout the country. Further we assumed that equal numbers of bird species would have been recorded either north or south of their former range, if apparent range extensions were solely the result of increased observer activity, which might be expected to produce records of easily overlooked (skulking or nocturnal), or uncommon species not previously reported from a given region of the country.

We listed all bird species exhibiting a shift in their former reported range limits<sup>25</sup> greater than c110 km (01° latitude), provided that the species had been recorded more than once in the country prior to 1985. This caveat was introduced in order to reduce the

likelihood of occasional, wandering migrants having a disproportionate effect on the results. Thiollay<sup>25</sup> reported *Lagonosticta rufopicta* as occurring north of 09°N but the four 'old' records mentioned by him appear to be from 10°12'N to 07°31'N<sup>18</sup>. Therefore, we used the latter figure in our analysis. *Estrilda caerulescens* was excluded from the analysis, despite fulfilling our criteria, because Demey & Fishpool<sup>8</sup>, who recorded it in Abidjan, speculated that an escaped cage bird was involved. Observations of the species, c6 km east of Bingerville in 1999 (HR pers obs), may also have resulted from escapees. If a new record was from an area, rather than a distinct locality, we considered the nearest border to the former locality as the reference (eg southern fringe of Comoé National Park, if the former locality was further south and the new observation in Comoé National Park). Therefore, our data included the minimum number of species that have extended their range. Palearctic migrants were excluded from the analysis, though eight species fulfilled our criteria. Four were observed further north than reported by

**Table 1.** Observations of southward range limit (>01°) shifts of birds in Côte d'Ivoire since 1985<sup>25</sup>

Species	Range limit in Thiollay <sup>25</sup>	New location	Reference	Distance
<i>Mycteria ibis</i>	Comoé NP	between Daloa and Douékoué	Demey & Fishpool <sup>8</sup>	01°54'
<i>Ciconia abdimii</i>	Bouaké	Grand Bassam	Demey & Fishpool <sup>8</sup>	02°33'
<i>Sarkidiornis melanotus</i>	09°30'	Dabou	Demey & Fishpool <sup>8</sup>	03°11'
<i>Gyps africanus</i>	Lamto	Sassandra	O Lachenaud pers comm	01°15'
<i>Agapornis pullarius</i>	Boundiali	Yapo	Balchin <sup>2</sup>	03°49'
<i>Oxylophus jacobinus</i>	Comoé NP	Adiopodoumé	Demey & Fishpool <sup>8</sup>	02°19'
<i>Caprimulgus tristigma</i>	Comoé NP	Tai (town)	pers obs	02°47'
<i>Tachymartus aequatorialis</i>	Mt Nimba	Abidjan	pers obs	02°16'
<i>Apus caffer</i>	Bouaké	Abidjan	pers obs	02°26'
<i>Phoeniculus aterrimus</i>	Bouaké	Lamto	Demey & Fishpool <sup>8</sup>	01°32'
<i>Riparia cincta</i>	Comoé NP	Adiopodoumé	Demey & Fishpool <sup>8</sup>	03°19'
<i>Hirundo preussi</i>	Korhogo	Blolékin	Gatter <sup>12</sup>	03°01'
<i>Hirundo aethiopica</i>	Katiola	Grand Bassam	Demey & Fishpool <sup>8</sup>	02°56'
<i>Hirundo lucida</i>	Lamto	San Pedro	Gatter <sup>12</sup>	01°29'
<i>Myrmecocichla cinnamomeiventris</i>	Touba	Marahoue	pers obs	01°17'
<i>Apalis flavida</i>	Comoé NP	Mt Tonkui	Balchin <sup>2</sup>	01°14'
<i>Lagonosticta rufopicta</i>	north of 9°(07°31')	Lamto	Thiollay <sup>25</sup>	02°47'01°18'
<i>Oryzospiza atricollis</i>	Man	Assinie	Demey & Fishpool <sup>8</sup>	02°24'
<i>Emberiza tahapisi</i>	Niangbo	Lamto	Salewski & Göken <sup>22</sup>	02°36'

**Table 2.** Observations of northward range limit (>01°) shifts of birds in Côte d'Ivoire since 1985<sup>25</sup>

Species	Range limit in Thiollay <sup>25</sup>	New location	Reference	Distance
<i>Microparra capensis</i>	Bouaké	Kafolo	Kühn & Späth <sup>13</sup>	02°13'
<i>Smithornis capensis</i>	Beoumi	Comoé NP	Demey & Fishpool <sup>8</sup>	01°09'
<i>Muscicapa caerulescens</i>	Danané	Comoé NP	Salewski <sup>20</sup>	01°29'
<i>Turdoides reinwardii</i>	Sipilou	Comoé NP, Gué Auto	pers obs	01°21'
<i>Anthoscopus flavifrons</i>	Tai NP	Danané	Gatter <sup>12</sup>	01°09'
<i>Ploceus nigricollis</i>	never north of 8°	23 km south of Ferkesedougou	Demey & Fishpool <sup>8</sup>	>01°
<i>Mandingoa nitidula</i>	Mt Nimba	Comoé NP	Salewski & Korb <sup>21</sup>	01°15'

Thiollay<sup>25</sup>. As migration can be expected near-continent wide<sup>10</sup> it is very unlikely that these observations represent range extensions. However, intra-African migrants were included because their movements are still very poorly known, including the extent to which different populations are involved. Furthermore, as these migrations are likely to occur between different vegetation and climate zones, a shift in the spatial distribution of these zones could lead to a real range extension or shift of the species involved. Finally, we confined the study to Côte d'Ivoire because the different vegetation zones form distinct belts, comparable with the list of Thiollay<sup>25</sup>. Comparing this list with the situation in other countries, eg neighbouring Ghana where Guinea savanna reaches the coast in the Dahomey Gap, would lead to biased results because of the different arrangement of the vegetation zones.

## Results

Records of changes in range limits were noted for 26 species (Tables 1–2). Significantly more species were observed further south (19, Table 1) than north (seven, Table 2) compared to known range limits in 1985 (binomial test, two-tailed  $p = 0.03$ ).

It might be expected that when observation efforts are spread randomly over a country and changes in range limits are recorded through increased observer activity, better equipment, or new observations of easily overlooked species or vagrants missed by previous observers, that this would produce a broadly equal number of northern and southern records. This is not the case and our data suggest a trend for birds to shift their range limits south in Côte d'Ivoire.

## Discussion

Range extensions can be caused by global (eg climatic change) or local (eg habitat change) factors<sup>25</sup>. The drought which has affected the Sahel region during the past 20 years has also influenced areas further south, as indicated by the decrease in rainfall in Côte d'Ivoire and other West African countries, eg Togo and Bénin<sup>17</sup>. In Côte d'Ivoire such a decrease was evidenced in the country's forest zone from the late 1950s for c30 years (Fig 1), which must have affected local vegetation. Furthermore, intensive clearance of rainforest and other wooded habitats has occurred in the country during recent decades<sup>4,11,26</sup> accelerating the effects of reduced rainfall and rise in global temperatures. Both could lead to range shifts or extensions of species from northern Sahelian regions to the altered Guinea savannas of the south, which has been suggested for *Eremopterix leucotis*<sup>25</sup>, although the species is known to wander

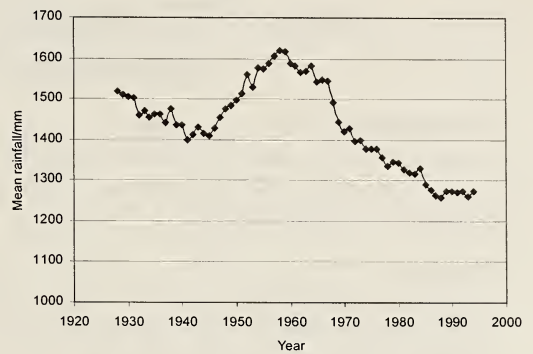


Figure 1. Eleven-year running mean of average rainfall from the 1920s to 1999 for five meteorology stations (Gagnoa, Man, Dimbokro, Daloa and Sassandra) in the forest zone of Côte d'Ivoire. Source: Sodexam, Abidjan.

and this was postulated on the basis of one record. However, our data do perhaps support this assumption. A similar effect had been observed prior to 1985 whereby several species of northern origin had been noted with increased frequency<sup>25</sup>, while savanna raptor species may have shifted their distribution south, or increased in the south of their ranges<sup>27</sup>.

It is unclear whether climate change or human activities play the major role, but both are probably responsible for present habitat alterations and cumulatively accelerate<sup>19</sup> the reactions of species assemblages in the region.

The affect on bird species may be even more pronounced than it appears from this study. Species such as *Smiithornis capensis*, *Muscicapa caerulescens*, *Turdoides reinwardii*, *Anthoscopus flavifrons* or *Mandingoa nitidula*, which possibly extended their ranges northward, occur in riparian forest along rivers. These woodlands serve as corridors for species from the southern forest zone to penetrate northern regions, and the species mentioned above are often easily overlooked. Therefore, it is more likely that these had previously been overlooked in northern forest habitats than the larger or more open-savanna species, such as *Mycteria ibis*, *Ciconia abdimii*, *Phoeniculus aterrimus* or *Ortygospiza atricollis* and the swallows and swifts, recorded further south of their previous known ranges since 1985.

We consider that observations relating range extensions of species to climatic changes must be interpreted with caution<sup>7</sup>. Nevertheless, such observations in the tropics are sparse and the situation concerning faunal research is far below the standard of that in temperate regions, with a basic lack of information on species distribution. Therefore, analyses such as that presented here, though comparatively

speculative, demonstrate the need for intensive monitoring of changes in species ranges and, in tropical regions, that range shifts are not only polewards<sup>15</sup>.

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